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VIII

NOTES ON SOME ECHINOIDS FROM THE SAN
RAFAEL AND TUXPAM BEDS OF THE
TAMPICO REGION, MEXICO

BY

MERLE C. ISRAELSKY

Assistant Curator, Department of Invertebrate Paleontology

In 1917 Dickerson and Kew published a paper entitled "The Fauna of a Medial Tertiary Formation and the Associated Horizons of Northeastern Mexico."¹ In that paper Kew described four species as new, and listed seven others as previously described species.

In his paper on the "Fossil Echini of the West Indies"² Robert Tracy Jackson questioned the specific determination of a number of the Echinoidea figured in the above paper by Kew. The present short paper is the result of a study initiated by reason of Jackson's note.

The geologic occurrence of the various species mentioned in the paper by Dickerson and Kew was given as "Upper Oligocene or Miocene." Since that time E. T. Dumble has given us a paper on "The Geology of the Northern End of the Tampico Embayment Area."³ In a footnote (p. 156)

¹ Proc. Calif. Acad. Sci., (4), Vol. 7, No. 5, 1917.

² Carnegie Institution of Washington Publ. 306, 1922, footnote on p. 98.

³ Proc. Calif. Acad. Sci., (4), Vol. 8, No. 4, 1918.

Dumble stated: "The nummulitic limestones of the San Rafael beds are ample warrant for their reference to the Oligocene. The Tuxpam beds were included in the Oligocene because of the identity of certain ferns. Some of these ferns, however, seem to indicate a later horizon and closer collecting may necessitate a reference of the Tuxpam beds to the Miocene."

1. *Cidaris cf. loveni* Cotteau*

Cidaris cf. loveni COTTEAU, KEW, Proc. Calif. Acad. Sci. (4), Vol. 7, No. 5, 1917, in check-list op. p. 128.

The specimen listed by Kew is not available for study at this writing.

Horizon: San Rafael Beds.

* For complete references to Cotteau's species, see Jackson, op. cit.

2. *Clypeaster pileus* Israelsky, new species

Plate 2, fig. 2; plate 3, fig. 2

Clypeaster cubensis COTTEAU, KEW, Proc. Calif. Acad. Sci. (4), Vol. 7, No. 5, 1917, p. 132, pl. 20, fig. 1; pl. 21, fig. 1.

Not *Clypeaster cubensis* COTTEAU, Kongl. Sven. Vet. Akad. Handl., Vol. 13, No. 6, 1875, p. 6, fig'd. in Bol. Com. Mapa Geol.

Espana, Vol. 22, 1897, p. 33, pl. 6, figs. 1 to 5.

Test large, more pointed before than behind, length greater than width, abactinally flat from the ambitus to the extremities of the petals, then gently domed to apex; apical system central; petals well formed, broad, nearly closing distally, the odd anterior petal but slightly longer than the posterior pair, the anterior pair the shortest. Greatest width nearly the same in all petals; at place of greatest width the interporiferous area is about twice as wide as each poriferous area. Actinal surface flat except for depression around peristome; periproct round, placed a distance slightly more than its diameter from posterior margin. Tubercles over whole of test. Length, 148 mm.; width, 131 mm.; height, 26.5 mm.

Type: No. 370, Mus. Calif. Acad. Sci., collected by E. T. Dumble and W. F. Sands from **Tuxpam Beds, Tampico Region, Mexico.**

In his footnote Jackson remarked that the specimen called *Clypeaster cubensis* by Kew "appears to be too flattened above the border and has petals too short proportionately to be referred to that species." To this may be added the fact that Cotteau's description calls for a markedly depressed actinal surface while the specimen at hand has a surface which is quite flat except near the peristome.

3. *Clypeaster sanrafælnsis* Israelsky, new species

Plate 2, figs. 1a, 1b

Clypeaster concavus COTTEAU, KEW, Proc. Calif. Acad. Sci. (4), Vol. 7, No. 5, 1917, pl. 21, fig. 3; pl. 22, fig. 2.

Not *Clypeaster concavus* COTTEAU, Kongl. Sven. Vet. Akad. Handl., Vol. 13, No. 6, 1875, p. 16, pl. 2, figs. 4 to 8.

Test small, outline subpentagonal, more attenuated before than behind; ambitus well rounded, upper surface rising gently from ambitus to edge of petals, then more abruptly to apex. Actinal surface gently depressed from margin to peristome; periproct elliptical, transverse diameter the greater, placed a distance slightly greater than its antero-posterior diameter from the posterior margin; apical system central, five genital pores; ambulacra petaloid, petals elongate, of nearly equal length, widest about one-half distance from apex to nearly closed extremities; inner pores round, outer slightly elongate; tubercles numerous over whole of test. Length, 50.2 mm.; width, 45.7 mm.; height, 11.6 mm.

Type: No. 372, Mus. Calif. Acad. Sci., collected by Cummins and Sands from San Rafael Beds, Tampico Region, Mexico.

Clypeaster sanrafælnsis closely resembles *Clypeaster rogersi* Morton (as figured by Clark & Twitchell⁴) in profile, but in outline the new species is more pointed anteriorly. *Clypeaster concavus* Cotteau is much more concave and thicker marginally than is *Clypeaster sanrafælnsis*, n. sp.

⁴U. S. Geol. Surv. Mon. 54, 1915, p. 136, pl. 64, figs. 2a, 2b, 2c, 2d, 3a, 3b, 3c, 3d.

4. *Clypeaster*, sp.

Clypeaster, sp. A, KEW, Proc. Calif. Acad. Sci. (4), Vol. 7, No. 5, 1917, pl. 23, fig. 2; pl. 24, fig. 2.

Fig'd. spec. No. 373, Mus. Calif. Acad. Sci. Horizon: San Rafael Beds.

5. *Scutella cazonensis* Kew

Scutella cazonensis KEW, Proc. Calif. Acad. Sci. (4), Vol. 7, 1917, p. 132, pl. 19, fig. 1.

Type: No. 369, Mus. Calif. Acad. Sci. Horizon: Tuxpam Beds.

6. *Paraster tampicoensis* Israelsky, new species

Schizaster clevei COTTEAU, KEW, Proc. Calif. Acad. Sci. (4) Vol. 7, No. 5, 1917, pl. 18, figs. 1a, 1b, 1c.

Not *Schizaster clevei* COTTEAU, Kongl. Sven. Vet. Akad. Handl., Vol. 13, No. 6, 1875, p. 29, pl. 5, figs. 7, 8,

Test of medium size; outline from above ovoid with notch anteriorly; apical system to rear of center; anterior ambulacrum nonpetaloid, deeply sunken on upper surface in a groove which diminishes in depth as the peristome is approached, the interambulacra forming slight ridges on sides of groove; paired petals deeply excavated; anterior pair the longer, slightly flexuous, interporiferous area about equal in width to each poriferous area; posterior pair short, about one-half length of anterior pair, rounded at extremities, interporiferous area equal in width to each poriferous area; posterior interambulacrum ridged; actinal surface gently rounded, peristome semi-lunar, labiate; primary tubercles larger on actinal than on abactinal surface, but rare on ambulacra; granules over whole of test; peripetalous fasciole sinuous, jointed to lateral fasciole near extremities of anterior paired petals. Length, 47.8 mm.; width, 43 mm.; height, 25.5 mm.

Type: No. 367, Mus. Calif. Acad. Sci., collected by W. F. Cummins from San Rafael Beds, Tampico Region, Mexico.

Paraster tampicoensis, n. sp., differs from *Paraster clevei* (Cotteau) in having lesser relative height and shorter posterior petals. Although the apical system is missing in our specimen the new species is tentatively placed in *Paraster* because of its close resemblance to *Paraster clevei* and other forms belonging to that genus.

7. *Schizaster dumblei* Israelsky, new species

Schizaster scherzeri GABB, KEW, Proc. Calif. Acad. Sci. (4), Vol. 7, No. 5, 1917, pl. 18, fig. 2; pl. 201, fig. 2.

Not *Schizaster scherzeri* GABB, Journ. Phila. Acad. Nat. Sci., Vol. 8, 1874-81, p. 348, pl. 45, figs. 28, 28a, 28b.

Test of medium size; outline from above ovoid with notch anteriorly, apical system posterior to center; viewed in profile the specimen shows a well-rounded ambitus except where truncated posteriorly; test highest in the posterior interambulacrum; odd anterior ambulacrum deeply sunken, reaching two-thirds of the distance to ambitus from the apical system; greatest width nearly one-third of length; posterior paired petals deeply depressed, only one-half length of anterior; greatest width one-half length; pores of paired petals slit-like; posterior interambulacrum ridge-like between the posterior petals; actinal surface gently rounded; peristome near anterior margin, semi-lunar, labiate. Tubercles over whole of test, primaries largest on actinal side; on plastron tubercles diminish rapidly in size from anterior to posterior portion; peripetalous and lateral fascioles present, but not well preserved. Length, 52 mm.; width, 44 mm.; height, 37 mm.

Named after Professor E. T. Dumble in recognition of his contributions to the geological knowledge of this region.

Type: No. 368, Mus. Calif. Acad. Sci., collected by E. T. Dumble and W. F. Cummins from San Rafael Beds, Tampico Region, Mexico.

The petals of *Schizaster dumblei*, n. sp., are relatively shorter than those of *Schizaster scherzei* Gabb, the posterior extremity is broader and the periproct is higher in the steeper posterior truncation.

8. *Agassizia regia* Israelsky, new species

Agassizia clevei COTTEAU, KEW, Proc. Calif. Acad. Sci. (4), Vol. 7, No. 5, 1917, pl. 7, figs. 1a, 1b.

Not *Agassizia clevei* COTTEAU, Kongl. Sven. Vet. Akad. Handl., Vol. 13, No. 6, 1875, p. 33, pl. 6, figs. 2 to 10.

Species of small size, ovoid, more rounded anteriorly than posteriorly; gently arched anteriorly from ambitus to apex; greatest height through apical system, the latter ex-centric posteriorly and containing four genital pores; anterior ambulacrum non-petaloid in slight furrow; anterior paired petals divergent, shallowly depressed with the anterior pair of pore rows atrophied as is characteristic of the genus; posterior paired petals short, more depressed than is the anterior pair, width about one-third length; plastron strongly elevated, ornamented with closely spaced scaly tubercles; peristome near anterior border, semi-lunar, labiate posteriorly; periproct in the posterior face; marginal fasciole passes from below the periproct up to point of juncture with peripetalous fasciole, then downward anteriorly to below ambitus in anterior ambulacrum; peripetalous fasciole sinuous, not clearly defined in type; small primary tubercles and intercalated granules over whole of dorsal surface of test. Length, 29.4 mm.; width, 26.5 mm.; height, 22.4 mm.

Type: No. 363, Mus. Calif. Acad. Sci., from Tuxpam Beds, Tampico Region, Mexico.

As Jackson (op. cit.) has suggested, this form is closely related to *Agassizia elevata* Jackson. It is, however, different in that it is both higher and broader in relation to its length than is *Agassizia elevata*. The lateral fasciole is much steeper in *Agassizia regia* than in *Agassizia clevei* Cotteau.

9. *Brissopatagus mexicanus* (Kew)

Macropneustes mexicanus KEW, Proc. Calif. Acad. Sci. (4), Vol. 7, No. 5, 1917, p. 134, pl. 24, fig. 3; pl. 25, figs. 1a, 1b.

Type: No. 375, Mus. Calif. Acad. Sci., from San Rafael Beds.

Kew remarked that "This species may be distinguished from other forms of *Macropneustes* by the curving of the

petals." This character is one belonging to the genus *Brissopatagus* Cotteau.

Brissopatagus mexicanus (Kew) resembles *Eupatagus* (*Brissopotagus*) *beyrichi* Dames⁵ in the form of the petals and ornamentation. It differs from Dames' species in its larger size, its less attenuated posterior extremity and in minute details.

10. *Macropneustes dubius* Israelsky, new species

Plate 3, fig. 1.

Macropneustes antillarum COTTEAU, KEW, Proc. Calif Acad. Sci. (4), Vol. 7, No. 5, 1917, pl. 24, fig. 1; pl. 26, figs. 1a, 1b.

Not *Peripneustes antillarum* COTTEAU, Kongl. Sven. Vet. Akad. Handl., Vol. 13, No. 6, 1875, p. 39, pl. 7, figs. 1 to 3.

Test large, somewhat cordiform, notched anteriorly, truncated posteriorly; ambitus well rounded; apical system well forward of center of test, contains four genital pores; all ambulacra deeply depressed, anterior non-petaloid and with simple pores; paired ambulacra petaloid, poriferous areas wider than interporiferous; anterior petals slightly flexuous, posterior nearly straight; actinal surface nearly flat; peristome near anterior margin, semi-lunar, labiate; peri-proct near top of posterior truncation; primary tubercles crenulate, perforate, limited abactinally to the area circumscribed by peripetalous fasciole except on borders of anterior furrow; common on interambulacra actinally; smaller tubercles over whole of test; peripetalous fasciole sinuous, re-entrant in the interrada; subanal fasciole questionable. Length, 88 mm.; width, 75 mm.; height, 46 mm.

Type: No. 374, Mus. Calif. Acad. Sci., from **Tuxpam Beds, Tampico Region, Mexico.**

The new species is much higher proportionately than is *Peripneustes antillarum* Cotteau.⁶

Jackson (op. cit., p. 86) remarked regarding *Macropneustes antillarum* (Cotteau): "This species is distinct

⁵ Paleontographica Bd. 25, 1887, p. 82, pl. 11, fig. 2.

⁶ Kongl. Sven. Vet. Akad. Handl., Vol. 13, No. 6, 1875, p. 38, pl. 7, figs. 1 to 3.

from others known in the genus in its great size, its elongate form, elevated anteriorly, and strongly inclined posteriorly, its wide and deep anterior furrow, its paired ambulacral petals very long and deep, its small tubercles and very sinuous peripetalous fasciole." It would seem that in so far as this to some extent applies also to *M. clevei* Cotteau and *M. dubius*, n. sp., that this group should be removed from *Macropneustes*.

The type species of *Macropneustes*, *M. deshayesi* Agassiz, has a rather simple peripetalous fasciole and the petals are but gently depressed.

Why Cotteau should have followed the lead of Duncan and have refuted his seemingly valid genus *Peripneustes* instead of redefining it with the above noted characters as a basis is rather puzzling to the writer.

11. *Plagiobrissus cumminsi* (Kew)

Metalia cumminsi Kew, Proc. Calif. Acad. Sci. (4), Vol. 7, No. 5, 1917, p. 133, pl. 21, fig. 2; pl. 23, fig. 1.

Type: No. 371, Mus. Calif. Acad. Sci., from **Tuxpam Beds.**

Since Kew described this species, H. L. Clark has, as stated by Jackson (op. cit. p. 83) revived the generic name *Plagiobrissus* Pomel for those species placed in *Plagionotus* L. Agassiz, the latter name being preoccupied. A. Agassiz in his Revision of the Echini merged this genus with *Metalia* Gray, a very closely allied group.

12. *Paleopneustes elevatus* Israelsky, new species

Plate 4, figs. 1a, 1b

Eupatagus, sp. Kew, Proc. Calif. Acad. Sci. (4), Vol. 7, No. 5, 1917, check-list op. p. 128.

Test large; outline from above ovoid; in profile the anterior slope much steeper than the posterior; ambitus well rounded; apical system forward of center; four genital pores; odd anterior ambulacrum non-petaloid, flush with surface of test; anterior paired ambulacra sub-petaloid, flush,

reaching nearly to ambitus, very divergent; outer pores longer than the inner; interporiferous area broader than each poriferous area at end of petals; posterior petals slightly longer than anterior, otherwise similar; primary tubercles numerous over whole of upper surface of test, scrobiculate and perforate; secondary and tertiary tubercles also present; underside of test largely missing; marginal fasciole not seen on specimen but as the ambital region is rather worn one may well have been present. Length, 128 mm.; width, 115 mm.; height, approx. 70 mm.

Type: No. 1649, Mus. Calif. Acad. Sci., from **San Rafael Beds, Tampico Region, Mexico**; collector not known.

This species is doubtfully placed in *Paleopneustes* Ag. It at least seemingly belongs to the family *Paleopneustidae*, the genera of which are at the present time not clearly understood.

In size the tubercles resemble those found in *Paleopneustes spectabilis* Meijere.⁷

13. *Lovenia dumblei* Kew

Proc. Calif. Acad. Sci. (4), Vol. 7, No. 5, 1917, p. 136, pl. 17, figs. 2a to 2c.

Type: No. 364, Calif. Acad. Sci. Horizon: Tuxpam Beds.

In this beautiful species the scrobicules are not reflected internally by "pursing." This character would place the species with that group termed *Sarsella* Pomel, which is variously considered as a genus or subgenus by different authors of note.

⁷ Siboga-Expeditie, Vol. 43, 1904, p. 172, pl. 8, figs. 86 to 90.